Update on Clinical Integration and Interventional Radiology Imaging

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Objectives:
• Integrate consensus-based protocols into everyday practice
• Discuss the importance of interdisciplinary care models
• Review work with multidisciplinary teams to establish and implement uniform best practices that can be tracked and improved over time
Clinical Integration
Interventional Radiology

Carl M. Black, M.D.

No Disclosures
Presentation includes off-label techniques
Objectives

• Integration of consensus-based protocols
• Interdisciplinary Team Approach

Optimize high-value patient care through integration of evidence-based interventional radiology practices with Intermountain Clinical Programs
2015 IR System Initiatives

• Ongoing
  – IVC Filter Tracking
  – INSTOR IA Stroke Registry

• New
  – Integration of IR care processes into i-Centra
  – Define role of endovascular PE Management
  – Integration of IR Oncology
American health care “gets it right” 54.9% of the time.

Variability is the Antithesis of Best Practice

Pragmatic Science
31 yof with PE and questionable compliance on warfarin
4 years later . . . “back pain.”
Medicine used to be simple, ineffective and relatively safe. Now it is effective, complex and relatively dangerous.

Sir Cyril Chantler

IVC Filter Risks

- Perforation
- Thrombosis
- Migration
- Retrieval failure
- Recurrent PE
- Malposition
- Bleeding
- Infection

How were we doing ???

• We did not know

• Anecdotal sense we could do better
Retrospective Review of 2007

• N = 209
• Only 55% documented follow up
  – Temporary or Permanent
  – Plan for follow up

Zakhary EM, et al. Optional filters in trauma patients: can retrieval rates be improved?
Lost to follow up or Delayed Decision Making

- **Scheduling**
  - Patient is a no show for appointment
  - Unable to Contact Patient

- **Communication**
  - Lack of follow up by Physician
  - Lack of follow up by Nursing Staff

- **Patient Education**
  - Inadequate Informed Consent
  - Inadequate Discharge Instructions

- **Cause and Effect**
  - No Accountability
  - False assumption that Someone else will follow
  - Multiple Providers

- **Non-Centralized Tracking**

- **Geography**

- **Trauma**

- **Visitors to Area**
Lost to follow up or Delayed Decision Making

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Geography
IVC Filter Tracking Pre- and post-Protocol

Protocol Initiated
January 2008
30-month Post Implementation Data

- \( n = 299 \)
- \( \geq 90\% \) stretch goal in 16 of 30 months
- 100\% compliance in 9 of the last 17 months
- Protocol Compliant Breakdown
  - Retrieval Success 91\% (\( n = 128 \))
  - Permanent Indication 52\% (\( n = 140 \))

- \( P<0.0001 \) (Fisher’s Exact Test) for 2007 vs New Protocol
Revised Process

Education and Follow-up
  • Education Documentation
  • Follow-up arranged

IVC Filter Placement

Disposition

IVC Filter Registry
  • PMD Office notification
  • Follow-up appointment made
  • Tracking form placed in chart
  • Patient info sheet signed

Inpatient
  Risk Factor Evaluation by IR/PMD
  Risk Factors Resolved
  Patient/Filter Evaluation
  Filter Remains

Outpatient
  Risk Factor Evaluation by IR/PMD
  Risk Factors Remain
  Filter Remains

Risk Factors Resolved

Filter Removed
IVC Filter - Pearls

- Assure appropriate implant indication
- Informed Consent: “This may not come out.”
- 100% decision making and tracking
  - Permanent
  - Temporary
    - ASAP
    - Patient and nurse sign instruction/appointment sheet
- Lost to Follow-up
It is more important that you do it the same than you do it right.

- Error Rates Fall
  *Less Complexity = Fewer Mistakes = Better Outcomes*

- Costs Fall
  *Efficiency*

- You can Apply the Scientific Method to Systematically Improve
  *Regardless of where you start you will end up with best demonstrated care practices*

Brent C. James, M.D., M.Stat
Which is better?
What do we know about iliofemoral DVT?

• Despite anticoagulation . . .
  – May be a lower incidence of recanalization.
  – Associated with venous hypertension and post-thrombotic syndrome.

• Amenable to thrombolyis

Acute DVT Management Strategy

Consider Hypercoagulability Work-up
Anticoagulation/Lysis Risk Assessment

IVC and/or Iliofemoral
- Unstable Thrombus?
  - Yes
    - Temporary IVC Filter
    - Lytic Contraindications?
      - PMT
      - Correct Underlying Stenosis
      - Compression Hose
      - Anticoagulation
      - Follow-up
  - No
    - Unresponsive to Anticoagulation
    - Isolated PMT*

Femoral/Popliteal
- Asymptomatic
  - Anticoagulation
  - Compression Hose
  - Follow-up

Isolated Calf
- Anticoagulation
- Compression Hose
- Follow-up
Discharge Checklist

• Compression Hose
• Patient Education (Standard Forms)
• Follow-up in our clinic at 1, 6, 12, 24 mo
• Is there need for hypercoagulable work up?
• Who will manage anticoagulation?
• Rx’s
• Follow-up letter to PMD and others
Why is treatment inconsistently applied ???

In patients with acute submassive and massive PE, systemic thrombolysis improves RVD dilatation [but] is associated with major bleeding, and is withheld in many patients at risk.

The ‘Submassive’ PE Population

Intermediate Risk

- 40% of the PE Population
- 21% mortality at 3 months
Predictors of Early Death

- Systemic arterial hypotension
- Imaging/biomarker evidence of RVD

AHA 2011 Treatment Guidelines

- Fibrinolysis may be considered for patients with submassive PE judged to have clinical evidence of adverse prognosis.
- Catheter-based intervention is reasonable for patients with submassive acute PE judged to have clinical evidence of adverse prognosis.
SEATTLE II

• Prospective, single-arm, multi-center trial to evaluate the safety and efficacy of ultrasound-facilitated catheter-directed low-dose thrombolysis
  – acute massive (N=31)
  – submassive (N=119) pulmonary embolism (PE).

• CT diagnostic criteria
  – proximal PE
  – dilated right ventricle (RV/LV ratio ≥ 0.9)

• 24 mg tPA (thrombolytic) at 1 mg/hour for 24 hours with a unilateral catheter or 1 mg/hour/catheter for 12 hours with bilateral catheters.

• The mean RV/LV ratio in the study decreased from 1.55 pre-procedure to 1.13 at 48 hours post-procedure, a difference of 0.42 (p<0.0001)

• No patients with massive PE died within the 30 day f/u period (massive PE has a reported mortality rate of about 52% at 90 days). Of the 150 patients in the study, only one death was directly attributed to PE.

• No intracranial hemorrhages and no fatal bleeding events.
  – 17 major bleeds
  – 16 moderate bleeds

Presented at American College of Cardiology, 2014.
RVD Assessment

- Biomarkers
  - Troponin
  - NT-pro-BNP

- Imaging RV:LV > 0.9
  - CTPA
  - Echocardiography
Why Now?

ACCP 2008 Guidelines
AHA 2011 Guidelines

30-day Safety and Efficacy

*Seattle II 2014
**ULTIMA 2014

*Presented at American College of Cardiology, 2014
"Acute PE – Management Sub-Work Group"

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<tr>
<td>Terry Clemmer MD</td>
<td>(Chair) Pulm./CCM</td>
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<td>Nancy Nelson</td>
<td>Administration</td>
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<td>Jose Benuzillo</td>
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<td>Don Lappe’ MD</td>
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<td>Joey Bledsoe MD</td>
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Next Steps?

1. CTPA Structured Report with RV:LV assessment
2. Establish triage decision tree
3. Define the role of role of low-dose catheter-based thrombolysis in the clinical PE care model
'Institutional Competency'
HPI and Risk Factors

• HPI: 76 yof (right handed) presents within 4 hours post witnessed onset of right hemiplegia and aphasia.
• Risk Factors: Hypertension
• Medications: Antihypertensive
Baseline Exam and Labs

• VS: 142/69, HR 74, RR 13, Sats 94% on RA
• PE: Right hemiparesis, aphasia with NIHSS = 15
• Labs: plts 190, PT 16.1 sec, INR 1.1
• EKG: NSR
Baseline Noncontrast HCT
Action Taken and Outcome

- Single Pass with MERCI Retriever
- 5 mg IA t-PA
- 48 hour ICU observation post intervention
- Discharged to home 6 days post admission
- NIHSS at discharge = 1 (0 at 90 days)
- Lives independently
< 0.5 ml contrast distal to obstruction, followed by 2 mg t-PA distal to and within the occlusion.
Post 3 mg supplemental t-PA
Baseline CBV

Follow-up 3 months
‘Best Practice’

- EMS
- ER
- Neurology
- Diagnostic Radiology
- IR
- Hospitalists
- Intensivists
- Cardiology
- Neurosurgery
- Rehabilitation
CTA-confirmed large-vessel occlusion at baseline, IMS III has a positive outcome for endovascular therapy.

Endovascular confers a real benefit across the spectrum of mRS

van Elteren test, p-value 0.0114

A. Demchuk, IMS III: Comparison of Outcomes between IV and IV/IA Treatment in Baseline CTA Confirmed ICA, M1, M2 and Basilar Occlusions, slide 20, Presented at ISC 2013, Honolulu, Hawaii
Consider IA Tx:

- Recent surgery
- Elevated INR, bleeding diathesis
- 3 to 8 hour time frame (otherwise on a case-by-case basis)
- Proximal, large vessel occlusions
- Posterior circulation (basilar strokes) <24 hours

David Sacks, MD, Carl M. Black, MD, Christophe Cognard, MD, John J. Connors III, MD, Donald Frei, MD, Rishi Gupta, MD, Tudor G. Jovin, MD, Bryan Kluck, MD, Philip M. Meyers, MD, Kieran J. Murphy, MD, Stephen Ramee, MD, Daniel A. Rüfenacht, MD, M.J. Bernadette Stallmeyer, MD, PhD, and Dierk Vorwerk, MD

INSTOR

INterventional Stroke Therapy Outcomes Registry™

www.strokeregistry.org
IR Oncology

• Imaging Options
• Endovascular Options
  – Radioembolization (Y-90)
  – TACE/DEB-TACE

• Thermal Ablation

Integration with Oncology Services
iCentra

- Pre- and post-procedure care processes
  - Consent
  - Order sets

- Facilitation of IR consultation

Standardized Approach
Interdisciplinary approach is ideal
Establish reproducible processes
Implement written protocols
Track processes and outcomes
Refine

Venous Thromboembolic Disease
IA Stroke Intervention
IR Oncology
EMR Optimization for IR